Correlation is not causation, but…

Correlation doesn't imply causation, but it does waggle its eyebrows suggestively and gesture furtively while mouthing 'look over there.'

– Randall Munroe[1]

Causal cat?

Every morning of my life (so far) when I've first opened my eyes from sleep, the world has been there. The regularity is astounding. Does my waking up *cause* the world to be there, or is this just a *correlation*, the happenstance of two events in succession with no interesting connection between them? We often hear that correlation is not causation, suggesting we know what each these two terms refer to and can distinguish them.

"Correlation" is the easier one to explain, easier to gather data for. It modestly claims *this* event often seems to happen whenever *that* one does, full stop.[2] But "causation"? What is that? It seems, in order to say "correlation is not causation," we need to know what both terms mean. Correlation seems clear enough but "causation"?

As David Hume remarked a few centuries ago, we seem to think that causation refers to a *necessary* connection obtaining between events. In judging relations between events, we are often not happy with *just* a connection, one of mere succession in time, we want to insist on a *necessary* one. What is a "necessary connection"? Presumably, there is such a connection whenever two events A and B happen, and B *always* or *almost always* follows A. But how is that different from a *very regular correlation*, like the one about the world and my waking up?

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[1] "...two meanings of the word *imply*: have as consequence, or insinuate. In the statement correlation does not imply causation, *correlation* is here seen as a person, giving you subtle hints where to look for the cause. This is a metaphor for research, where the correlation must be investigated further, perhaps in a wider scope or with the consideration of more variables, so that the reason for it is understood. For example, Barry Marshall and Robin Warren noticed that the presence of *Helicobacter pylori* was highly correlated with duodenal ulcer patients. They investigated further. Result: the Nobel Prize in Medicine. " From https://www.explainxkcd.com/wiki/index.php/552:_Correlation.

[2] The strength of empirical correlations is always on a continuum from *sometimes* to *almost every time*… but never *strictly* "every time." To go so far is to leave the empirical realm and wax metaphysical. As when we posit natural laws as though these were more than empirical generalizations, sporting corroboration by abstract systems of mathematics.

Tuesday *very regularly* comes right after Monday. Does Monday *cause* Tuesday to happen? No?...[3] Very regular correlation, even (known) exceptionless regularity, cannot be enough to jump to a judgment of causation. What is missing? We want to say A is doing something *to make* B happen? Do we ever observe this supposed something? One characteristic of this something is that it makes B happen *with necessity.* Do we ever observe this necessity? Something *in addition to* regular correlation?

Perhaps the necessity consists in *not observing anything else but A* correlated with B? But when does that ever happen? Either there is no pattern to the succession of events in the universe (all is random), or every event in the history of the universe is, however remotely, related to every *other* event. It is not just event A that precedes B, it is the entire state of the universe *at time* t_0 *when A happens* that precedes the state of the universe *at time* t_{0+1} *when B happens*. The entire state of the universe is implicated in anything's happening – assuming there is causal necessity going on anywhere at all.

But we never *observe* entire states of the universe. Looking near or far, we observe only events like A followed by events like B. Drawing conclusions about specific states of the universe would be worse than astronomers drawing conclusions about the weather on distant exoplanets with a *micro*scope.

We can posit laws or rules that govern the appearance or manifestation of events, and place the necessity there. But these laws or rules themselves are never observed at the edge of our senses. They are inspired by *correlations* which are open to view by us. Rules and laws are organizing principles more or less useful to *our* projects as *we* may organize documents into folders with labels in order to access them later. Moreover, *we* delimit the boundary of an event, again, with an eye toward organization, *i.e., our* convenience. Organization serves *our* projects. For example, why is midnight (usually) defined as part of the next day? Nothing about time dictates such a demarcation. Just as *we* slice time into periods, experiences *we* slice into events. *This* is the beginning of the event, *that* the middle, and *that* other the end of one event and the start of another. Again, *we* are doing this.

An implication of *necessity* is that these demarcations somehow "carve reality at its joints" as one philosopher put it. This explains their necessity. There are *real* joints indicating where we carve.[4] We don't make them up arbitrarily... But these "joints"? How do *we* explain them? Aren't these objects *we* demarcate? The fact they offer us less resistance is no indication that independently of out capabilities they have significance. Show me a joint that is different from an event that I may witness and remark upon, or, as they say, turn into "a thing." Who decides what counts as a "thing"? On what basis?

But mustn't there be causal relations between things that do *not* involve asserting or implying anything about a "we" anywhere in their description or explanation? We had nothing to do with the Big Bang if there was one. Yet it got the universe off to start… Really?

In other words, what's "cause" got to do with a universe – one *with* or *without* us in it? Causation seems important because, as Marianne Talbot reminds us, we need it to *explain* things and make

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[3] We may be tempted to say Tuesday's coming after Monday is *not* a natural phenomenon, the way water's boiling at a certain temperature is. The succession of days of the week is a human convention but water boiling is not. Does this mean that "temperature" is not a human convention? That Celsius, Fahrenheit, and Kelvin are not conventions? That the demarcation of these concepts and the names given them pre-existed us?... But, we insist, there was *something* to correspond to temperature *before* we specified it... And there weren't *somethings* corresponding to days *before* we remarked and christened them?

[4] Is the universe like a roasted chicken or an fresh-baked loaf of bread? We can slice the latter anyway we like, the former poses constraints.

predictions so that we may *manipulate* elements of our situation. But what does our "need" to do these things have to do with the way things really "are"?

The selectivity of causation

> Although we tend to credit or blame things on a single major cause, in nature and in science there are almost always multiple factors that have to be exactly right for an event to take place.[5] For example, we might attribute a forest fire to the carelessly thrown cigarette butt, but what about the grassy tract leading to the forest, the dryness of the vegetation, the direction of the wind and so on? All of these factors had to be exactly right for the fire to start. Even though many tossed cigarette butts don't start fires, *we zero in on human actions as causes*, ignoring other possibilities, such as sparks from branches rubbing together or lightning strikes, or acts of omission, such as failing to trim the grassy path short of the forest. And we tend to focus on things *that can be manipulated:* We overlook the direction of the wind because it is not something *we can control* [emphasis added]. ("The Slippery Math of Causation," Pradeep Mutalik, *Quanta Magazine*. 30 May 2018.)

We point a finger at things "we can control" and say "*there* lies the cause…" How convenient...

But this seems to mean that a designation of causation is premised on the assumption that we can, sometimes, at least, *manipulate* things, that is to say, *that we have free will*.[6] We are sometimes *in control.* In this way, we are entitled to *filter* experience. Whence this ability, this range of free control?

And isn't the idea that one thing may be the cause of another thing an essential premise in deterministic arguments? In other words, doesn't determinism depend on a coherent notion of causation?

But then, if causation itself depends on our capacity to be agents who bring about events, *and* if a fallout of determinism is that we *don't* have such free will – *including that to designate or filter out what is a cause and what not*, then mustn't causation be an illusion? The thesis of determinism rules out one of its own essential elements: the *non-anthropogenic* specification of a "cause." Or something else here is illusory? If not cause, then determinism? Free will? Both? The lot?

Two philosophers on free will and determinism

It seems, *either* determinism means something *other* than what it is usually taken to mean...[7] *or* it, too, is *as* suspect as what it is often taken to oppose: free will.

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[5] For example: almost no one dies ***of*** Covid in isolation – or influenza, for that matter. The most direct cause of so-called Covid fatalities is a *bacterial* infection catalyzed by these *viral* infections: pneumonia. But Covid or influenza can be involved as part of a constellation of comorbidities complicit in such deaths, including diabetes, heart conditions, obesity, etc. Thus, death ***with*** Covid is the norm among the recent pandemic deaths. But to single out the SARs-CoV-2 virus as *the* cause, warranting extraordinary measures *not* taken to ward off the predisposing comorbidities, signals a *non*-scientific, *non*-medical motive. This describes, not reality, but a *human* agenda or *anthropogenic* norm.

[6] In the absence of free will, we may "manipulate" nothing. Rather, if any notion of manipulation even applies in this absence, then it is *we* who are being manipulated, *i.e.*, causally determined.

[7] *Logical,* as opposed to *causal* determinism, otherwise known as "fatalism," determines in a way that makes no reference to causation. This is another topic.

In a nutshell, the line of argument here is that determinism seems to depend, *via the notion of causation*, on some notion of free will:

1. Determinism depends on a notion of causation.
2. Causation depends on a notion of free will.
3. Therefore, *determinism depends on free will.*

Determinism depends on free will?!

What is broken in this argument? If it is free will that must be rejected – in this case, manifested in our ability to willfully focus on aspects of experience that matter *to us* – and this, our lack of free will, is determined, then causation, *as anything but glorified correlation*, must be rejected, too. But this means that determinism, too, because of its dependence on a similar[8] notion of causation, must be rejected. That leaves *indeterminism: s*tuff happens, no rhyme or reason.

In other words: No free will, hence no causation to depend on it, hence no determinism depending on a similar notion of causation, and, assuming there are only three options, that is, if either,

1. determinism, or
2. free will, or
3. indeterminism

fully compass the logical possibilities. And the first two are ruled out because of their shared dependence on causation, that leaves *indeterminism*[9] alone to describe events.

Might there be *another* kind of causation involved in determinism that is *not* similar to that presupposed by free will? Yes or no? If *yes*, then free will and determinism may coherently coexist. Nothing forces them to get in each other's way. They don't play on the same field. If *no*, the conflict between them is chimerical. It is like arguing about which of two ghosts exists before settling the question whether *any* ghosts exist. So, then, it all comes down to causation: does *any* notion of it *that does not reduce to correlation* exist to validate determinism *and* free will?

If not, indeterminism must describe the relation between events in the universe. *It is all chance.* The regularities that we find useful and consoling are local anomalies. Natural laws are not natural at all in the sense that they would still exist and govern *in any meaningful way*[10] in the absence of our remarking on them. Only in the sense that we are compelled to concoct them and, though our naked existence is natural, no different from elements on the periodic table, nothing *about us* is necessary, hence nothing we, or our contingent proclivities, concoct is either. These laws and all they cover are collectively *and* subjectively – that is, anthropocentrically – regional. We note patterns in our *infinitesimally* small corner of the universe, and project them outward with unabashed omniscience. Randomness does not preclude pockets of order. We exist in one.

We might seek to escape this puzzle by:

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[8] And if there are *multiple* notions of causation in play, what explains the contentiousness of the debate?

[9] *Non-causal* determinism may still hold. See previous note on fatalism.

[10] Since "meaningfulness" is a human/animal interest.

1. Conceding causation is simply a local illusion: there in only correlation in the universe, absent us. Nothing more. This undercuts *both* determinism and free will.

2. But who needs causation, and the puzzles it entrains, if what we really want and require is a measure of predictability, not necessity? If we may only require sufficiently high levels of confidence in our guesses, we need not posit and contend with troublesome notions like causation, free will, or determinism to conclude what we want to conclude, what serves any purpose we may rationally seek to have.

3. It has seemed to some thinkers that very high levels of predictability can be achieved with very high amounts of information and the tools to process this vast store. Our computational powers have augmented in recent times and so has our ability to gather vast amounts of information. “Big data” is a movement that sees in this a way out of our tangled concepts through an epistemics of brute force information gathering. This would enable discarding speculative notions like causation and what it depends on (e.g., free will) as well as what depends on it (e.g., determinism).

Can we live and function with only high levels of *local* predictability even in the face of *ultimate* randomness? Dump the overly strenuous demands of rigid concepts like cause, determination, and agency? Wing it with informed hunches?

Causal norms

Christopher Hitchcock on causation, etc.:

> In any given situation, there is an underlying objective causal structure. But it is very complicated. It is often useful to provide a simple, take-home message about what caused some event of interest. That is what we are reporting when we make a claim about actual causation. Norms play a role in determining what that simple take-home message is.
>
> There has also been an awkward tension in discussions of actual causation. Non-philosophers frequently make a distinction between causes and mere background conditions. The lightning strike caused the forest fire; the oxygen in the atmosphere was a mere background condition. Starting with Mill, there has been a tradition of dismissing this distinction as philosophically meaningless. At best, it is a matter of pragmatics which of these causes one chooses to focus on. But philosophers draw distinctions, e.g., between cases of preemption where there is causation, and other cases with similar structures (such as cases of “switching” and “short circuits”) where there is not causation. That is, philosophers think that the second kind of distinction is getting at something about the metaphysics of causation, while the former is not. I think that both distinctions are on a par, and that norms play a role in both of them.
>
> I think that things in the world are causally connected, but there are many different ways in which they can be causally connected. And for some reason, philosophers have devoted a lot of effort to determining which of these connections are and are not cases of causation. For example, suppose I play music on my stereo. The setting of the power button and of the bass and treble knobs all affect the sound that comes out. By pressing the power button, I can cut off the sound completely, but that is all I can do. By turning the bass and treble knobs, I can

> exercise a more fine-grained control over the sound, but I can’t eliminate the sound completely. According to [David] Lewis’s original counterfactual theory of causation (from 1973), the position of the power switch is a cause of the sound, but the positions of the bass and treble knobs are not. According to his later theory of causation as influence (2000), it’s the other way around. My own view is that there is no genuine issue to be resolved here. Once we understand the different ways in which the sound depends upon the buttons, there is no further issue of which buttons cause the sound. (http://www.3ammagazine.com/3am/causation-probability-philosophy/#.WZG1uAjkenw.twitter)

And whence the norms? If these anthropogenic norms shape our notion of causation, but we also posit a larger conception of reality in which there are natural laws that unfailingly shape an objective reality – don’t these concessions clash?

Resources

Marianne Talbot offers an excellent, accessible, introductory lecture on the idea of causation, starting with one of its first theorizers, David Hume. Watching at least the first lecture in the series is highly recommended before attending. It will make our presentation more comprehensible if philosophical questions around causation are new to you.

Physicist Sean Carroll is trying to find equations to back up philosophical intuitions on causation. There is nothing about the known universe that prevents effect *preceding* cause, suggesting mere correlation is all there is all the way down. Known physical laws are indifferent to the direction of time. More below on backward causation.

Extended writeup for the topic hosted at
The Philosophy Club in September 2024
Accessible at Archive.org

– Victor Muñoz
Guanajuato / Seattle

Notes

From Talbot’s lectures

Why causation is important? Because it seems critical to accomplishing certain activities we value:

- explanation,
- prediction, and
- manipulation.

Attempts to analyze[11] causation can be sorted into those that seek to

- reduce,
- eliminate,
- make basic, or
- acknowledge the concept as *not* univocal.

In other words, decide causation

- is not a thing in itself but comprised of more basic elements (which are?),
- is an idea we can learn to do without (can we?),
- deem it a basic tool of human comprehension, or
- accept that there are different kinds of causation which may explain why we get confused thinking about it as *just one* thing (as in the free will/determinism debate).

Along the way, we'll review David Hume's classic Regularity Theory of Causation (RTC), the more recent Counterfactual Theory of Causation (CTC), and, finally, Singular Theory Causation (STC)… and criticisms of each and where we stand now.

Hume's mentions two ways of characterizing causation:

- constant conjunction
- counterfactual dependence

The first is straightforward RTC.

The second says that if event C had not happened, then event E would not have happened. Event E's happening depends on a prior event C's happening. This makes E dependent on C. If so, then we can say C is the cause of E. This is called *counterfactual dependence* and attempts, but – probably – fails to go beyond the mere regularity of the conjunction of C and E. This theory, known as CTC, has been put forward as a rival and theory to RTC, a supposedly more insightful one. But is it? Recent philosophers, such as David Lewis, thought so. More recently still, it has been argued *not really* by philosophers like Helen Beebee.

Does CTC suggest that E can never happen in the absence of the prior event C? Can't windows break for many reasons besides having bricks thrown at them? Is there really no other reason a window may break?

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[11] This four way sorting is common to many other puzzling or vague concepts in philosophy. It's one path to clarification.

Thoughts on *backward* causation

Hume viewed causation as referring to

1. a *necessary* connection between two events where,
2. one event, *the effect*, follows another, *the cause*, in *time*, and
3. there is *spatial* contiguity.[12]

(Recall, correlation makes no stipulations about precedence in time or contiguity in space.)

We discuss the *temporal* aspect of causation:

It seemed to Hume (and many others) that the concept of causation entails that a cause *precedes* its effect in time. But is this always true? Might the effect *precede* the cause? Or both occur simultaneously? What is it about the physical world that precludes these possibilities? The equations of physics say nothing definite about this. The possibility that the succession in time of these two events needn't always follow the cause-first/effect-second pattern has occurred to some.

Consider *the event* of a *prediction:* a prediction event is not a *report* on present or past events. It is an event that occurs in time, and it seems natural to conceive of a "true" or "false" prediction. A prediction is always an assertion about what *will or will likely* happen. Is there such a thing as a *true* prediction? What would it take to make a prediction true? Mustn't it be a *future* event? A future event has to corroborate the prediction, a necessarily precedent event, in order to make the prediction "true." *But prediction, to remain prediction, can't be true, otherwise it is a report.* A prediction *now,* when made "true" by a *future* event, ceases to be a prediction. It turns from being a prediction into a true report on a *then* past event. Reports can be true or false, straightforwardly. A prediction is always a statement about an imaginary state of affairs. If the state of affairs ceases to be imaginary, if it becomes a verifiably true description of an event, then it is a report, not a prediction, and a truth value *then* may attach to it.

A prediction must always precede what it predicts or it is not a prediction. This is part of what it means to be a prediction. What makes a prediction true is always an event yet-to-happen. This post-prediction event, yet-to-happen, *causes* or brings about the event of a "true" prediction. But, in so doing, the yet-to-happen event transforms the prediction into a report. In the event of its corroboration, the prediction ceases to be a prediction. So far, so good.

But, how can there be such a thing as a "true" prediction? If it's true, it can't be a prediction. If it's still a prediction, then no future event has yet caused it to cease to be a prediction, that is, caused it to become a report.

So, it seems either predictions vanish on being corroborated, or their present truth value, if any, depends on a future event. The *future* event will cause, have the effect of setting, its *present* truth value. Thus, a future event causes a present valuation event, a temporally past event to the cause.

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12. The spatial contiguity seems very much to be contingent feature of our inability to grasp infinitely complex causal networks. It is less a conceptual problem than the temporal aspect of causation.

So, a “true” prediction can only be coherent if we allow a future event to cause, or bring about, an event *prior* to it. A “true” prediction only makes sense if backward causation makes sense. Otherwise, we must abandon the idea of a “true” prediction. Or, we speak very loosely when we assert any such thing. What we really mean is that a past prediction was *transformed* into a report – *not* that it is or was true. A truth value can never attach to it as long as it is a prediction. If we think otherwise, we must be implicating backward causation.

Future events *cause* predictions to *either* vanish *or* the future events have a *backward* effect: the setting of a prediction event’s truth value. Only in this way can you have your prediction and have it be true, too. And this backward effect seems to be as necessary as any causative feature, given the specified understandings of how cause, prediction, report, and time work.

…

Again:

We must distinguish a *prediction event* which, to prevent incoherence, *must* precede the event it predicts, a necessarily future, *i.e.,* imagined event. The predict*ed event* is another event later in time. Let’s call the latter the *corroboration event.* The corroboration event is always in the future. Prediction events are always in the present or the past. When the corroboration event comes to pass, it essentially *deposes* the prediction event. It does *not* make the prediction event true. It may make the prediction claim, now deposed, replaced by a proper *present* claim, true – but not the event at which it was made. Events are not made true. Semantic values may be conferred on propositions associated with events, but a prediction event is not a proposition. It is an object of ontology. No matter what the corroboration event indicates it does not alter the ontological status of the prediction event. We knew presumably already that the prediction event occurred. What the corroboration event, in effect, does is give semantic import to the hypothetical proposition associated with the prediction event derived from what follows from a *report* on an event – namely, the corroboration event – now *having* occurred. Reports always live in the present or past, never in the future. The corroboration event makes the report proposition true. It gives it a truth value, something a prediction event never had, nor can have.

Only if we stipulate that propositions associated with prediction events may have their truth values altered by *future* events and the propositions associated with them, does it makes sense to speak of a “*true* prediction.” This is how backward causation enters the picture: A future event is altering a past one: *if* we want to insist on the possibility of a “true (or false) prediction.”

Alternatively, we can avoid this consequence by stipulating that predictions can never be true or false. They exist *only* as events – ontological entities, semantically inert. If they acquire semantic significance, these events are subverted or converted into reports about present or past events.[13] Predictions vanish, hence, and are replaced by reports with proper truth values. But it makes no sense to think of predictions themselves having truth values. At most, they occur or they don’t, but cannot sport semantic content. Yet, it seems a prediction claim associated with an event *prior* in time is semantically sensitive to a *future* event which may affect its truth value. I am assuming that semantic *changes* or *sensitivities* are tied to events in time.

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[13] Or even just *present* events… I am here assuming the less radical “growing block” theory of time in which both present and past may harbor truths. The status of predictions only worsens with a presentist theory of time in which truth values reside only in the present.

…

Objection

The corroboration event validates or invalidates the prediction's *implied future report* – which, *qua* report, is conceded a truth value. The prediction itself is not validated or invalidated, nor is any event prior to the future report affected by the corroboration event. Thus, no retrocausation. "True" or "false" prediction = true or false *future* report. Thus nothing *in the past* is being caused or effected by anything *in the future*.

Certainly, the *fact* of the prediction event is not altered. However and whenever it was made, this event's ontological status, remains an immutable past event. Any *semantic* property associated with the fact of the event may go from undetermined to determined, but this change is contemporaneous with the future corroboration event. Again, nothing about the past changes because of something in the future.

Response

How may a (past or present) prediction and a (future) report refer to the *same* event? A view about time is implicated. The first refers to a non-existent, the latter to a newly existent. The claim is that predictions *with a pretense to objective semantic content* are incoherent. Their function is more akin to subjective or normative claims. Agenda-driven as these are, they are not descriptions of anything; they are expressions, rather like sighs or gestures. They are always *presentist.*

Viewed this way, how is *backward* causation different from standard *forward* causation when the cause ceases when the effect begins? The two are never contemporaneous unless *both* are effects of some third thing. But whatever this third thing – the alleged real cause, it, too, cannot be contemporaneous with its alleged effects, multiple if they are.

On a *presentist* conception of time, *nonexistent* past events would have to cause *existent* present ones, or, alternatively, causation is altogether obviated: the non-existent *cannot* effect the existent. Since only the present supports existence, there is no "time space" for causes to precede effects. The present is not big enough to accommodate both. Causation requires either an eternalist or a growing block theory of time.

The problem is that in the *eternalist* conception of time there can be no future corroboration. There is a truth value attached to a prediction from the start however epistemically inaccessible. If cause amounts to a change, there can be no change. There may be "true" predictions, metaphysically (accessible to omniscience), but no causation.

For the *growing block* theory of time, the problem is that there is no reality to any future event. Hence true predictions are incoherent since they refer to event items in a nonexistent future. They are condemned to await a supposed "corroboration" event that, when it comes to pass, will obviate, not corroborate.

...

From the SEP on backward causation :

> A proper notion of backward causation requires that the future is just as real as the present and the past. It is common among metaphysicians to distinguish between three different views on time. The first is *presentism*. This view claims that only events that exist now really exist. Past or future events do not exist. Past events have ceased to exist, whereas future events are yet to become real. So only statements about the present or related to the present have a definite truth value. The second view is *possibilism* according to which both past and present events exist, but future events are still only possible or non-existing. This view is sometimes called *the growing block universe*. As a consequence, the view holds that only statements about past and present events have a definite truth-value, but statements about the future are either probably true or may completely lack any truth-value. Finally, the third view is called *eternalism*, also named *the block universe*. This position maintains that every past, present and future event *tenselessly* exists at a certain time and that statements about these events therefore have a definite truth-value at every other time.
>
> Usually, presentism and the growing block universe are associated with the dynamic view of becoming. The transient now plays an ontological role as the ever changing time in which things become real or perhaps, if you are a presentist, cease to exist. One reason to prefer the growing block universe from presentism may be the analysis of forward causation. In order for a present event to be caused by a past event, the past event must exist. Nothing, which does not exist in the past, can cause something that presently exists. By the same token, if the backward causation is a conceptual possibility, something must exist in the future in order for it to cause something in the present.
>
> Thus, backward causation demands eternalism or a static account of time in the sense that there is no objective becoming, no coming into being such that future events exist on the par with present and past events. It means that the future is real, the future does not merely consist of unrealised possibilities or even nothing at all. Ordinarily we may think of the past as a nothing that once was a something. But when asked what makes sentences about the past true or false, we would probably also say that it is the facts of the past that make present sentences about the past either true or false. The fact that I went to the cinema yesterday makes it true today when I say that I went to the cinema yesterday. This view is a realist one with respect to the past. If backward causation is to be conceptually possible, it forces us to be realists with respect to the future. The future must contain facts, events with certain properties, and these facts can make sentences about the past/future true or false. Such a realist account is provided by static and tenseless theories of time. Eternalism is such a theory and holds that the participation of time into the past, the present and the future depends on the perspective we human beings put on the world. The attribution of pastness, presentness and futureness to events is determined by what

we take to exist at times earlier than and times later than the time of our experience. (For further discussion, see the entry on being and becoming in modern physics.)